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CONNECTION ADMISSION CONTROL BASED ON CHANNEL CAPACITY ESTIMATION FOR KA-BAND ALL-IP SATELLITE COMMUNICATIONS

Abstract

Next generation satellite networks based on the Internet Protocol (IP) are specially suited to develop a multi-service network where services with different features in terms of offered traffic and Quality of Service (QoS) requirements can be provided.

The provision of a wide range of data applications generating bursty traffic, on an IP-based commercial network infrastructure used for real-time applications, requires a robust QoS support. Although static QoS provisioning seems reasonable for high capacity networks, in satellite networks (limited highly-variable capacity) adaptive QoS should be implemented to optimize the usage of the channel and also provide service differentiation.

Adaptive IP QoS management is based on a cross-layer cooperation mechanism that provides information either on the available satellite resources for a given Satellite Terminal (ST), the link performance or on the application traffic demands. It performs runtime adaptations to maintain an optimum QoS under existing resource constraints. Adaptive QoS managers are able to reflect the changes on the user requirements or in the satellite resources and analyze the impact of lower-layer parameters in the higher-layer connections.

Admission Control (CAC) algorithms implemented in such QoS managers should be aware of the available and used network resources over the satellite domain and in each ST. The existing studies on CAC algorithms for broadband satellite access systems assume stable channel conditions and, in most cases, focus only in either the return link or the forward link capacity. Moreover, most of the CAC proposed in literature do not consider a minimum bandwidth for Best Effort (BE) traffic implying that in congestion conditions, all BE traffic will be blocked.

Besides, satellite telecommunication links operating at Ka-band are greatly disturbed by tropospheric phenomena which can degrade link availability and service quality. Three kind of effects have to be considered: attenuation, scintillation, and the increase of the antenna temperature in the receiving ST. The short-term dynamical behavior (fade slope and duration) of the propagation channel become important when dealing with adaptive satellite networks.

Our paper introduces a novel connection admission control algorithm that takes into account the Ka-band channel capacity estimation, based on the dynamical behavior of the attenuation impairments, which considers both the forward and return link available capacity, allowing for the management of connection requests based on the current state of the interactive network and in the expected changes in the available bandwidth, providing better QoS for all different traffic types, and avoiding BE traffic blocking.